

## TYPES OF FISHES.

BY HENRY W. FOWLER.

The history of the Academy's collection of fishes, like that of others in possession of the Society, begins with contributions during the early days of its existence. These contributions were at first mainly small donations from members and others, the number gradually increasing by additions from special regions. In 1868 we find that owing to the then greatly increased size of this department of the museum, a joint report of a Committee on herpetology and ichthyology was printed. Exploration of different parts of America then furnished the Academy with many of the most valuable additions. Accessions were received from Dr. J. K. Townsend, Prince Charles Lucien Bonaparte, Drs. W. O. Ayres, W. S. W. Ruschenberger, Charles Hering, William A. Hammond, Charles C. Abbott, J. H. Slack, H. C. Wood, W. H. Jones, Messrs. Samuel Ashmead, P. Duchailu, Samuel Powel, Rev. Alden Grout, Prof. William M. Gabb, the Smithsonian Institution, Prof. E. D. Cope, and the United States Fish Commission. Many other collections of greater or less size were also received, but as the writer wishes to call attention to only a few of the more important reference to them may be omitted. Most of these have been treated of fully or in part in the publications of the Academy or other American journals.

The collection of Prince C. L. Bonaparte was purchased and presented by Dr. Thomas B. Wilson, who was also a generous contributor to many other departments of the Academy. This collection, consisting for the most part of Italian fishes, contained all the species figured and described in the *Fauna Italica*, most of which are still well preserved. The greater part of this collection consisted of alcoholics, though there were 177 examples of dried skins.

Mr. Ashmead's collections were mostly local, like those of Dr. Abbott, who published a number of his observations. Dr. Ayres

made collections principally in California, Dr. Hammond in Kansas and Mr. Powel in Rhode Island. In the West Indies Dr. Van Rijgersma collected at St. Martins, Dr. Griffith in St. Croix and Dr. H. C. Wood in New Providence. Dr. Hering collected fishes in Surinam and Dr. Ruschenberger at Rio Janeiro and various other localities. Many of the most valuable additions were presented by the Smithsonian Institution, among which are a series of typical examples, mostly Catostomidæ and Cyprinidæ. The explorations in the west and southwestern regions of the United States secured many novelties described by Dr. Charles Girard and Prof. S. F. Baird.

The most extensive and numerous contributions are due to the exertions of Prof. E. D. Cope. Collections from the Kanawha, Holston and Roanoke rivers included large series of species with many types. His entire alcoholic collection was bequeathed to the Academy, including many fresh-water fishes from the upper Amazons, made by Prof. James Orton and John Hauxwell.

The fishes obtained in the province of Rio Grande do Sul, Brazil, should be mentioned, as they are the basis of Cope's last important contribution to South American ichthyology. His other noteworthy collections are from Pennsylvania, North Carolina, Texas and Florida.

In the present paper it is intended only to treat of the Marsipobranchii, Selachii and Ganoidei, and it is believed that references to all the typical representatives of these groups that are preserved in the collections are included.

I have appended rather rough descriptions of the alimentary or enteric canal to most of the species fit for dissection, which are represented by duplicates.

To the authorities of the Academy I am much indebted for permission to make these dissections from duplicate specimens.

#### PETROMYZONIDÆ.

##### 1. *Ichthyomyzon concolor* (Kirtland).

*Ammocetes concolor* Kirtland, Bost. Journ. Nat. Hist., III, 1841, p. 473, Pl. XXVII, fig. 1.

No. 354. Type of *Ammocetes epytera* Abbott, *Proc. Acad. Nat. Sci. Phila.*, 1860, p. 327. Ohio river. Dr. Hildreth.

As I am unable to determine this larval specimen satisfactorily, I have followed Profs. Jordan and Evermann in provisionally

referring it to the above species. It has about 56 muscular bands between the posterior gill-opening and the anus.

### SCYLLIORHINIDÆ.

#### 2. *Pristiurus melastomus* (Rafinesque).

*Galeus Melastomus* Rafinesque, Caratt. Anim. Sicil., 1810, p. 13.

Nos. 566 to 574. Types of *Seyllium melanostomum* Bonaparte, *Fauna Italica*, Pesci, Tomo III, vii, 1834, 89, Pl. 131, fig. 3 (two figures). Italy. Bonaparte Coll. (No. 253). Dr. T. B. Wilson.

*Mouth*.—Moderately large, somewhat spacious and compressed. The jaws alone are furnished with teeth. Tongue a little free in front, broad and flat, though somewhat rounded anteriorly. The inside of the mouth is lined with smooth integument altogether destitute of shagreen.

*Pharynx*.—Spacious, elongate and compressed. Upon the walls of the branchial arches are patches of fine shagreen, otherwise the rest of the integument lining this region is perfectly smooth. There are 5 gill-openings within the pharynx, which lead into as many gill-pouches, and finally communicate externally by as many gill-slits. Of the internal gill-openings, which are greater than those which are external, the anterior is the largest, and they all gradually diminish in length until the last, which is not more than  $\frac{1}{3}$  the length of the first. The gill-pouches contain the gill-filaments, and they are separated from each other by means of inter-branchial septa. The gill-filaments are distributed in each gill-pouch, so as to appear continuous, except in the last, where they are only upon the anterior walls. They are of moderate number, compressed, and adnate, except distally, to the walls of the gill-pouches. There is a well-developed spiracle aperture within the pharynx, anterior and superior to the first gill-opening. It is furnished with pseudobranchiæ.

*Œsophagus*.—Short and somewhat constricted. The walls more or less plicate.

*Stomach*.—Spacious and bulky, and the walls greatly plicated, except in the pyloric region. The tissues of this division of the enteric canal are thicker than any other.

*Intestine*.—The duodenum is very short, existing as a simple tube greatly constricted, until the presence of the colon is indicated

by the spiral valve. The diameter of the colon is much greater than any other division of the intestine, and posteriorly its boundaries are fixed by the terminus of the spiral valve, and the last division of the intestine is formed. This is the rectum. It is of more constricted dimensions than the colon, persisting as a short simple tube to the cloaca, into which its contents are conveyed by means of the rectal aperture. There is a rectal gland which is confluent with the rectum.

*Liver*.—Large and bulky, the left lobe greatly exceeding the right in dimensions.

*Spleen*.—Present in the usual position.

*Pancreas*.—Developed.

#### GALEIDÆ.

##### 3. *Galeus mustelus* (Linnæus).

*Squalus Mustelus* Linnæus, Syst. Nat., Ed. X, 1758, p. 235.

Nos. 605 to 608. Types of *Mustelus equestris* Bonaparte, *Fauna Italica*, Pesci, Tomo III, vii, 1834, 43, Pl. 132, fig. 2. Italy. Bonaparte Coll. (No. 254). Dr. T. B. Wilson.

*Mouth*.—Moderately large, somewhat spacious and compressed.

Sharp teeth upon the jaws. Tongue broad, flat and free in front. Inside of the mouth roughened more or less with fine shagreen.

*Pharynx*.—Spacious, elongate and compressed. The walls of the branchial arches are roughened and also the floor of the pharynx. Gill-openings 5 within the pharynx, which lead into as many gill-pouches, and finally communicate externally by as many gill-slits. The internal gill-openings, in fact the entire branchial system, resembles that of *Pristiurus melastomus* so far as observed. The spiracle aperture within the pharynx, anterior and superior to the first gill-opening.

*Esophagus*.—Short and constricted, with the walls plicate.

*Stomach*.—Rather long, spacious and bulky. There are few plications upon the walls of the cardiac region. Pyloric region short.

*Intestine*.—Duodenum short. Colon large and very bulky, especially its median portion, and furnished with a spiral valve. The rectum short and simple, terminating in the cloaca. A rectal gland is developed which is confluent with the rectum.

*Liver*.—Exceedingly large, occupying the greater part of the abdominal cavity. Both lobes are equal.

4. *Galeus mento* (Cope).

*Mustelus mento* Cope, Proc. Amer. Philos. Soc., XVII, 1877, p. 47.

No. 21,104. Type of *Mustelus mento* Cope. Pacific Ocean at Pecosmayo, Peru. Coll. of Prof. James Orton, 1876-77. Prof. E. D. Cope.

Body elongate, slender, and tapering much after the first D., where the greatest depth is located. Head large, with a flattened snout which is pointed. The interorbital space is broad, broader than the snout. Eye of moderate size, lateral, and its anterior margin over the tip of the mandible. Posterior to the eye and very near its posterior edge is the spiracle which is furnished with small pseudobranchiæ. The nostrils are each furnished with a flap.

The snout anterior to the mouth is greater than the space between the external borders of the nostrils, and it is also greater than the width between the external corners of the mouth. The teeth are smooth, rounded and rhombic. Mouth furnished with a broad flattened tongue, and there are also two entire buccal flaps at the bases of the jaws. Gill-slits 5, about equal, and the last above the base of the P. Origin of the first D. about over the middle of the P. The fin itself is large, and its base is greater than its height. It has a posterior projection, the tip of which seems to me to be slightly in advance of the origin of the V. The origin of the second D. is much in advance of that of the A., and its posterior base is about over the last third of the base of the A. The base of the second D. is much greater than the height of the fin, and it is also furnished with a posterior projection which is attenuated. The middle of the first D. is about midway between the posterior root of P. and anterior root of the V. The P. very broad, and flattened. The space between the inner edges of the bases of the P. less than the width of the mouth. The V. broad and blunt, and without inner posterior projections. The A. is very small and with a sharp posterior projection. Caudal notched. Lateral line present, its course somewhat decurved posteriorly in the region of the second D.

The coloration is not entirely uniform as described by Prof. Cope. The general color of the body is a leaden-brown, somewhat darker dorsally. There are several bands of dark blackish-brown

upon the upper anterior portion of the body. These are about 6 in number, and the two behind the eye, and over the anterior gill-slits, are the most distinct. Below light brownish, with a pale buff or ochraceous tinge.

5. *Galeorhinus galeus* (Linnaeus).

*Squalus Galeus* Linnaeus, Syst. Nat., Ed. X, 1758, p. 234.

Nos. 617 to 620. Types of *Galeus canis* Bonaparte, *Fauna Italica*, Pesci, Tomo III, viii, 1834, 43, Pl. 132, fig. 3. Italy. Bonaparte Coll. (No. 248). Dr. T. B. Wilson.

*Mouth*.—Moderate, spacious and compressed. Jaws furnished with more or less flattened teeth. The tongue is flat, free anteriorly, and of a slightly triangular shape with the front margin rounded obtusely. Patches of fine shagreen upon the roof of the mouth and the tongue.

*Pharynx*.—Of the usual spacious, elongate, and compressed pattern. Patches of fine shagreen upon the walls of the branchial arches. There are 5 gill-openings within the pharynx, leading in turn into as many gill-pouches, and communicating externally by as many gill-slits. The internal gill-openings are largest anteriorly, and gradually diminish until the last, which is the shortest. Each gill-pouch contains the usual complement of gill-filaments, the last pouch with only  $\frac{1}{2}$  the number of the others and adnate to the anterior walls. Spiracle developed within the pharynx anterior and superior to first gill-opening. No pseudobranchiæ.

*Œsophagus*.—Short, spacious and walls plicated.

*Stomach*.—Elongate and spacious, the walls sparingly plicate. Pyloric region moderate.

*Intestine*.—Duodenum short. Colon large and bulky, also furnished with a spiral valve. Rectum short and simple, and opening into a cloaca. Rectal gland present.

*Liver*.—Large, occupying the greater portion of the abdominal cavity. Both lobes about equal.

*Spleen*.—Present in proximity to the pyloric region.

*Pancreas*.—Present.

#### DALATIIDÆ.

6. *Dalatias licha* (Bonnaterre).

*Squalus Licha* Bonnaterre, Tabl. Encyclopéd., Ichth., 1788, p. 12.

Nos. 478 and 479. *Seymnorhinus* Bonaparte, *Cat. Meted. Pesc. Europ.*, 1846, p. 16 = *Dalatias* Rafinesque, *Caratt. Anim. Sicil.*,

1810, p. 10 = *Scymnus* Cuvier, *Règne Animal*, II, 1817, p. 130, which is preoccupied in Insects. Italy. Bonaparte Coll. (No. 240). Dr. T. B. Wilson.

#### RHINOBATIDÆ.

##### 7. *Rhinobatis columnæ* (Bonaparte).

*Rhinobatus columnæ* Bonaparte, *Fauna Italica*, Pesci, Tomo III, xiv, xvii, 1835-36, 86, Pl. 152 (two figures).

Nos. 476 and 477. Types of *Rhinobatus columnæ* Bonaparte. Italy. Bonaparte Coll. (No. 228). Dr. T. B. Wilson.

There is also a dried specimen of this species, No. 16,920, Bonaparte Coll. (No. 73). Dr. T. B. Wilson.

##### 8. *Platyrrhinoides triseriatus* (Jordan and Gilbert).

*Platyrrhina triseriata* Jordan and Gilbert, *Proc. U. S. Nat. Mus.*, 1880, p. 36.

No. 528. Cotypical of *Platyrrhinu triseriata* Jordan and Gilbert. Santa Barbara, Cal. From the U. S. Fish Commission (No. 26, 893). This is one of the several specimens described by Profs. Jordan and Gilbert, and they have indicated an adult male, taken at Santa Barbara, Cal., February 8, 1880, by A. Larco, an Italian fisherman, as the type. This specimen is in the collection of the U. S. National Museum.

#### RAJIDÆ.

##### 9. *Raja punctata* Risso.

*Raja Punctata* Risso, *Ichth. Nice*, 1810, p. 12.

Nos. 503 to 515. Types of *Dasybatis asterias* Bonaparte. *Fauna Italica*, Pesci, Tomo III, xxix, 1840, 154, Pl. 149, fig. 2. Italy. Bonaparte Coll. (No. 230). Dr. T. B. Wilson.

*Mouth.*—Broad or compressed. Teeth only upon the jaws. Tongue absent. Superior buccal flap bilobed and fringed. Inferior buccal flap entire. The inside of the mouth is smooth, and destitute of fine shagreen patches.

*Pharynx.*—Of the usual spacious, compressed and elongate pattern. The posterior portions of the roof and floor of the pharynx, together with the inner surfaces of the branchial arches, with patches of fine shagreen. Gill-openings 5, the median the longest, the second and fourth next in size, and the first and fifth the smallest and about equal. The gill-openings lead into as many gill-pouches, and finally communicate externally by as many gill-



slits. All the gill-pouches, except the last, and that has only its anterior half, furnished with the usual continuous complement of gill-filaments. These gill-filaments are adnate to the inter-branchial septa for the greater part of their length, and are free only at their distal extremities. Spiracle aperture well developed within the pharynx, superior and anterior to the first gill-slit. It is furnished with pseudobranchia.

*Esophagus*.—Short and constricted, the walls more or less plicate.

*Stomach*.—Moderate and rather bulky, the walls more or less smooth though furnished with a few convoluted plications, especially in the lower cardiac region. Pyloric region moderate.

*Intestine*.—Duodenum short. Colon large and bulky, furnished with a spiral valve. Rectum a short simple tube finally merging into the cloaca. Rectal gland developed and confluent with the rectum.

*Liver*.—Large and trilobed, though the median and left lobes are rightly two divisions of one and the same lobe. Gall-bladder developed.

*Spleen*.—Developed.

*Pancreas*.—Present.

10. *Raja miraletus* Linnaeus.

*Raja Miraletus* Linnaeus, Syst. Nat., Ed. X, 1758, p. 231.

Nos. 404 and 405. Types of *Raja quadrimaculata* Bonaparte, *Fauna Italica*, Pesci Tomo III, iii, 1833, 18, Pl. 146, fig. 2. Italy. Bonaparte Coll. (No 221). Dr. T. B. Wilson.

*Mouth*.—Broad, flat and compressed. Teeth only upon the jaws. No tongue. Superior buccal flap quadrilobate and fringed.

Inferior buccal flap broadest medianly and also fringed. Inside of the mouth smooth and destitute of shagreen.

*Pharynx*.—Spacious, elongate and compressed. Patches of shagreen are distributed upon the inner surfaces of the branchial arches, the roof and the floor of the pharynx. The gill-openings within the pharynx are 5, the median the longest, the second and fourth next in size, and the first and fifth the smallest, and equal. The gill-openings communicate next with as many gill-pouches and finally open externally by as many gill-slits. There is a continuous complement of gill-filaments within each gill-pouch, except the last, and that is furnished only upon the anterior half. The gill-



filaments are adnate to the inter-branchial septa for their greater portion, only free proximally. The spiracle aperture is anterior and superior to the first gill-opening, and it is furnished with small pseudobranchiæ.

*Œsophagus*.—Short and constricted, with wrinkled walls.

*Stomach*.—Sac-like, moderately bulky, and the walls somewhat plicate, especially in the lower cardiac region.

*Intestine*.—Short duodenum which is simple. Colon spacious and with a spiral valve. The rectum a short simple tube merging finally into a cloaca. A rectal gland is developed which is confluent with the rectum.

*Liver*.—Large and trilobed. The median and left lobes are properly two divisions of the left lobe. Gall-bladder well developed.

*Spleen*.—Rather large.

*Pancreas*.—Present.

This species preys upon small fishes, as remains of small Teleosts, one three inches or more in length were taken from the gullet.

11. *Raja radula* De la Roche.

*Raja radula* De la Roche, Ann. Mus. Hist. Nat., Paris, XIII, 1809, p. 321.

No. 389. *Batis* Bonaparte, *Cat. Metod. Pesc. Europ.*, 1846, p.

12. Italy. Bonaparte Coll. (No. 233). Dr. T. B. Wilson.

12. *Raja circularis* (Couch).

*Raja Circularis* Couch, Cornish Fauna, Part I, 1838, p. 53; preliminary description in Loudon's Magazine of Natural History, Charlesworth, New Series, Vol. II, 1838, p. 71 (with fig.).

No. 406. Type of *Raja falsavela* Bonaparte, *Fauna Italica*, Pesci, Tomo III, xxvi, 1839, 136, Pl. 148, fig. I. Italy. Bonaparte Coll. (No. 221). Dr. T. B. Wilson.

This specimen is almost dissolved and I identify it only from the original label which is certainly referable to this species.

13. *Raja oxyrinchus* Linnaeus.

*Raja Oxyrinchus* Linnaeus, Syst. Nat., Ed. X, 1758, p. 231.

Nos. 523 to 527. *Laeviraja* Bonaparte, *Fauna Italica*, Pesci, Tomo III, xxv, 1839, 130, Pl. 151, fig. 2. Italy. Bonaparte Coll. (No. 226). Dr. T. B. Wilson.

14. *Raja stellulata* (Jordan and Gilbert).

*Raja stellulata* Jordan and Gilbert, Proc. U. S. Nat. Mus., 1880, p. 133.

No. 414. Typical of *Raja stellulata* Jordan and Gilbert. Monterey. From the U. S. Fish Comm. (No. 26,975).

This species was described from eight examples, of which this is one, and were at that time said to have been in the U. S. Nat. Mus.

15. *Psammobatis brevicaudatus* Cope.

*Psammobatis brevicaudatus* Cope, Proc. Amer. Philos. Soc., XVII. 1877, p. 48.

No. 21,261. Type of *Psammobatis brevicaudatus* Cope. Bay of Pecosmayo, Peru. Coll. of Prof. James Orton. Prof. E. D. Cope.

## NARCOBATIDÆ.

16. *Tetronarce nobiliana* (Bonaparte).

*Torpedo nobiliana* Bonaparte, Fauna Italica, Pesci, Tomo III. xii. 1835, 63, Pl. 154 (two figures).

Nos. 426 to 440, 461 to 470, and 16,948. Types of *Torpedo nobiliana* Bonaparte. Italy. Bonaparte Coll. (Nos. 234 and 15). Dr. T. B. Wilson.

In these specimens the first D. is inserted almost over the posterior edge of the V.

*Mouth*.—Moderate, though not particularly spacious. Teeth only upon the jaws. Tongue absent. Buccal flaps both entire, of rather even width, and not papillose or fringed. Inside of the mouth smooth and entirely destitute of shagreen.

*Pharynx*.—Elongate and spacious and with apparently smooth integument, except upon the inner surfaces of the branchial arches which are asperous with fine shagreen. Gill-openings 5, the median the largest, the second and fourth next in size, and the first and fifth the smallest, and about equal. The gill-openings open into 5 gill-pouches, which also communicate externally by 5 gill-slits. The gill-pouches are separated from each other by the interbranchial septa, and each one contains a continuous complement of gill-filaments, except the last, which has only its anterior half furnished. The gill-filaments are joined for most of their length to the walls of the interbranchial septa, though their distal extremity is free for a short distance. Spiracle aperture anterior and superior

to the first gill-opening from which it is separated by a considerable space. It is furnished with small pseudobranchiæ, though in moderate number.

*Esophagus*.—Constricted and somewhat short, the walls much plicated.

*Stomach*.—Moderate and bulky, and the walls strongly plicated.

*Intestine*.—Duodenum the usual short simple tube merging into the short and very bulky colon which is furnished with a spiral valve. The rectum is a short simple tube, finally terminating in the cloaca. A rectal gland is developed and confluent with the rectum.

*Liver*.—Large and bilobed, and with the left lobe the largest. It is furnished with a gall-bladder.

*Spleen*.—Present.

*Pancreas*.—Present.

#### DASYATIDÆ.

##### 17. *Dasyatis bruceo* (Bonaparte).

*Trygon bruceo* Bonaparte, Fauna Italica, Pesci, Tomo III, VI, 1834, 34, Pl. 151 (two figures).

Nos. 378 and 379. Types of *Trygon bruceo* Bonaparte. Italy. Bonaparte Coll. (No. 218). Dr. T. B. Wilson.

*Mouth*.—Moderate and broadly compressed. Teeth only upon the jaws. Tongue absent. Superior buccal flap of almost uniform width and with a fringed edge. Inferior buccal flap entire, except 5 or so filaments which are distributed at nearly equal distances. Integument of the inside of the mouth smooth and without any shagreen.

*Pharynx*.—Broad and compressed, and without any shagreen patches, even upon the inner surfaces of the branchial arches. Gill-openings 5, the median the largest, the second and fourth next in size, and the first and fifth the smallest. They open into as many gill-pouches and externally by as many gill-slits. Gill-filaments in the usual continuous series in each gill-pouch, except in the last, where they are only upon the anterior portion. They are flattened or compressed, and adnate to the inter-branchial septa, except distally for a very short portion, which is free. Aperture of the spiracle superior and anterior to the first gill-opening. No pseudobranchiæ appear to exist.

*Esophagus*.—Short and constricted with plicate walls.

*Stomach.*—Moderate and not very bulky, though it may be very distensible. Its walls are plicate. Pyloric region moderate.

*Intestine.*—Duodenum a simple tube of short length. Colon bulky and furnished with a spiral valve. Rectum a short simple tube, merging into the cloaca. Rectal gland present.

*Liver.*—Exceedingly large, consisting of two lobes, of which the left is the largest. A gall-bladder is present.

*Spleen.*—Large.

*Pancreas.*—Present.

This species preys upon small Teleosteans, as a number of scales and other remains were taken from the pharynx of the example described.

18. *Dasyatis violacea* (Bonaparte).

*Trygon violacea* Bonaparte, Fauna Italica, Pesci, Tomo III, I, 1832, 6, Pl. 155 (two figures).

Nos. 385 and 386. Types of *Trygon violacea* Bonaparte. Italy. Bonaparte Coll. (No. 220). Dr. T. B. Wilson.

*Mouth.*—Moderate and broadly compressed. Teeth only upon the jaws. Tongue absent.

*Pharynx.*—Broad and compressed. Gill-openings 5 and like the preceding. In fact, the pharynx in general is much like the preceding.

*Esophagus.*—Short and constricted.

*Stomach.*—Rather large and bulky, more so in the lower cardiac region. Pyloric region developed.

*Intestine.*—Duodenum short. Colon very large and bulky, and furnished with a spiral valve. Rectum short and simple, emptying its contents into the cloaca to which it is joined. Rectal gland confluent with the rectum.

*Liver.*—Large and bilobed, the left lobe the largest. Gall-bladder present.

*Spleen.*—Present.

*Pancreas.*—Present.

ACIPENSERIDÆ.

19. *Acipenser naccarii* Bonaparte.

*Acipenser naccarii* Bonaparte, Fauna Italica, Pesci, Tomo III, XVI, XVII, 1836, 87, Pl. 129, fig. 2.

Nos. 624 and 625. Types of *Acipenser naccarii* Bonaparte. Mediterranean. Bonaparte Coll. (No. 2). Dr. T. B. Wilson.

*Mouth*.—Moderately large and capacious. No asperities whatever upon the walls and teeth absent. No buccal flaps. A broad tongue, bluntly rounded and hardly free in front.

*Pharynx*.—Rather large, long and compressed, and also destitute of asperities. The apertures of spiracles are placed superior and anterior to the first gill-opening. The gill-openings are 5 in number, the first the largest and the others gradually decreasing in size until the last, which is the smallest or shortest. They all communicate with the branchial chamber, forming 4 separate or free branchial arches and one adnate to the posterior part of the pharynx. The four free branchial arches are furnished with the usual complement of gill-filaments, distributed along their outer edges. No gill-filaments upon the last branchial arch. Upon the inner anterior and posterior edges of the branchial arches are short, fleshy, filamentous gill rakers. They are not very numerous, not  $\frac{1}{3}$  the length of the longest gill-filaments, and longest medianly. The branchial arches themselves seem rather broad.

*Œsophagus*.—The enteric canal is now somewhat constricted, persisting posteriorly until under the posterior portion of the air-bladder, when it turns and is produced anteriorly until posterior to the pericardial cavity. Here it forms a somewhat exaggerated condition known as the stomach.

The œsophagus is connected by a large tube, though short, with the air-bladder. This is placed a short distance from the pharynx and upon the first or upper division of the œsophagus.

*Stomach*.—Rather small and apparently not very capacious or distensible. The walls are considerably thickened, the tissue being muscular. After this the pyloric region is marked by a large, compressed and rounded sac, which is nearly as large as the stomach itself.

*Intestine*.—The duodenum persists first posteriorly, then runs forward a short distance, after which the colon is formed. Its walls are porous and not muscular.

The colon is furnished with a spiral valve and no rectal gland is present. The rectum is well developed.

*Liver*.—Large, anterior and superior, and bilobed.

Ryder<sup>1</sup> says under *Acipenser brevirostris* Le Sueur: "How much more extensive than the Delaware River its range may be I

<sup>1</sup> Bull. U. S. Fish Comm., VIII, 1888, p. 236.

have no means of knowing, as I have found only one specimen, besides the five obtained by myself at Delaware City, which can be regarded as an authentic example of the species. This single specimen is in the museum of the Academy of Natural Sciences of Philadelphia, and consists of a dried and stuffed varnished skin marked in white paint '84.' It agrees in every essential external particular with my own alcoholic specimens, but no record of its history is accessible amongst the catalogues of the collections of that institution; all traces of the old manuscript catalogues of the Bonaparte and the other old collections of fishes belonging to the Academy's museum having been lost. I have, however, the strongest suspicion that this specimen, which is evidently very old, judging from its present condition, may be one of the originals of Le Sueur's description published in the *Transactions* of the American Philosophical Society for 1818, though it does not correspond in minor details. That it may possibly be one of the types of the species seems to me not at all improbable, from the fact that Le Sueur was also one of the early members of the Academy and may have presented the specimen."

I have not been able to find this specimen, and so far as I know the only specimen from Le Sueur's collection at present in the Academy is his *Cyprinus maxillingua*. Many of the typical specimens he described were in the old Philadelphia Museum, and after its dissolution they may have been destroyed in the conflagration of P. T. Barnum, who purchased part of the natural history material. For a short account of Peale's Museum see Stone, *Auk*, XVI, 1899, pp. 167 to 169.

#### LEPISOSTEIDÆ,

##### 20. *Lepisosteus osseus* (Linnaeus).

*Esox osseus* Linnaeus, Syst. Nat., Ed. X, 1758, p. 313.

No. 16,971. Type of *Lepisosteus crassus* Cope, *Proc. Acad. Nat. Sci. Phila.*, 1865, p. 86. (Dried skin.)

Cope says: "The type specimen was probably taken in brackish water at Bombay Hook, near the mouth of the Delaware river." In the *Proc. Acad. Nat. Sci. Phila.*, 1859, a *Lepisosteus*, most likely this specimen, is entered among the donations to the museum on the 8th of March as "Gar Fish. *Lepisosteus bison?* Caught in the Delaware river at Bombay Hook. Presented by Mr.



Andrew Vanderslice." No. 14,405 is a specimen belonging to the present species which was secured in the Delaware Bay many years ago. It is labeled as having been obtained from Mr. Holbrook.

No. 16,968. Type of *Lepilosteus otarius* Cope, *Proc. Acad. Nat. Sci. Phila.*, 1865, p. 86. (Dried skin.)

This specimen was one of a collection of fishes said by Prof. Cope,<sup>2</sup> to have been "brought from the Platte river, near Fort Riley, by Dr. William A. Hammond." It is very evident, as Profs. Jordan and Evermann have observed, "Fort Riley was on the Kansas river."

21. *Lepisosteus platostomus* Rafinesque.

*Lepisosteus platostomus* Rafinesque, *Ichth. Oh.*, 1820, p. 72.

No. 16,958. Type of *Cylindrostreus productus* Cope, *Proc. Acad. Nat. Sci. Phila.*, 1865, p. 86. San Antonio, Tex. (Dried skin.) Dr. A. L. Heermann.

EXPLANATION TO PLATES XII, XIII, XIV, XV.

PLATE XII, fig. 1.—*Acipenser naccarii* Bonaparte.

Fig. 2.—*Pristinurus melastomus* (Rafinesque).

PLATE XIII, fig. 3.—*Galeus mustelus* (Linnæus).

Fig. 4.—*Galeorhinus galeus* (Linnæus).

PLATE XIV, fig. 5.—*Raja punctata* Risso.

Fig. 6.—*Dasyatis violacea* (Bonaparte).

Fig. 7.—*Raja miraletus* Linnæus.

PLATE XV, fig. 8.—*Tetronarce nobiliana* (Bonaparte).

Fig. 9.—*Dasyatis bruceo* (Bonaparte).

The letters referring to the different parts of the viscera are the same in all the figures: *a.* left lobe of liver; *b.* right lobe of liver; *c.* stomach; *d.* pyloric region; *e.* spleen; *f.* small intestine; *g.* colon; *h.* rectal gland; *i.* rectum; *k.* median lobe of liver; *l.* air bladder; *m.* œsophagus.

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<sup>2</sup> *Proc. Acad. Nat. Sci. Phila.*, 1865, p. 85.